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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

TA YEN CHING
JOSEPH L. GOODRICH
JAMES P. LEONARD
KENNETH W. RUSSELL

Serial No.: 09/127,316

Filed: July 31, 1998

For: POLYMER WITH PENDANT CYCLIC OLEFINIC FUNCTIONS FOR OXYGEN SCAVENGING PACKAGING

Group Art Unit: 1772

Examiner: Sandra M. Nolan

Attorney Docket: 2039.001600/RFE

APPEAL BRIEF

CERTIFICATE OF MAILING (37 C.F.R. § 1.8)

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October 15, 2002 Cynde Meinhart
Cynde Meinhart

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Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Applicants hereby submit an original and two copies of this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated May 22, 2002. The fee for filing this Appeal Brief is $320. If the check is inadvertently omitted, or should any additional fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to the enclosed material, or should an overpayment be included herein, the Assistant Commissioner is authorized to deduct or credit said fees from or to Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/2039.001600RFE.

I. REAL PARTY IN INTEREST

The assignee of this application is Chevron Chemical Company LLC, and the real party in interest is its successor in interest, Chevron Phillips Chemical Company LP.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences known to Appellant will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 99-194 have been rejected and are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments have been filed in this application after the final rejection. All previous amendments have been entered.

In the preparation of this appeal brief, Applicants noted a typographical error in claim 183. As it currently stands, claim 183 recites dependence on canceled claim 78. It should recite dependence on claim 182. Applicants propose correcting this error at such time that claim 183 is found by the Office to be patentable over Ching and Nordstrom, as discussed at sections VI.A and VIII.A, below.

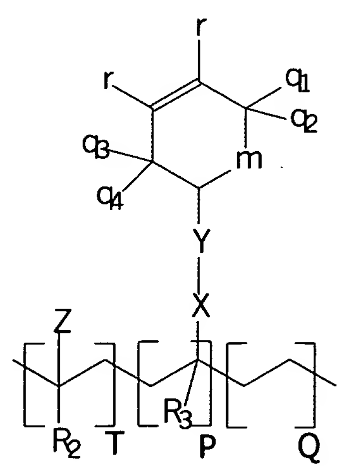
V. SUMMARY OF THE INVENTION

The present invention relates to compositions suitable for scavenging oxygen, and packaging articles comprising such compositions (p. 6, lines 2-4 and 9-15). The compositions comprise polymers having cyclic olefinic pendant groups (p. 6, lines 2-4). It was well-known that ethylenically unsaturated hydrocarbons (i.e., hydrocarbons comprising $-HC=CH-CH_2-$ moieties) react with oxygen at an alpha carbon (a carbon atom bonded to a carbon atom

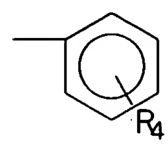
participated in the carbon=carbon double bond) to form a product containing a -HC=CH-CHOH- moiety. However, it was generally observed that after reacting with oxygen most ethylenically unsaturated hydrocarbons gave off volatile reaction by-products and unwelcome odors, which would contaminate a food product contained within a package comprising the ethylenically unsaturated hydrocarbons (p. 4, lines 24-27). As should be apparent, such contamination is undesirable.

In making the present invention, Applicants discovered polymers having cyclic olefinic (also known as "cyclic allylic") pendant groups generally do not give off volatile reaction by-products and unwelcome odors (p. 5, lines 18-22). Applicants consider the molecular basis of this benefit is that cyclic olefinic structures are less likely to fragment after oxidation (p. 5, lines 22-25). To the best of Applicants' knowledge, they were the first to recognize this benefit of polymers having cyclic olefinic pendant groups used in oxygen scavenging packaging applications.

In one embodiment, the present invention is a compound comprising structure II:



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; $-(C{=}O)OR_1$; $-O(C{=}O)R_1$; and an alkyl aryl group:



where R_4 is selected from the group consisting of $-CH_3$, ethyl, and hydrogen; R_1 is selected from the group consisting of hydrogen, methyl, ethyl, $-C_3H_7$ and $-C_4H_9$; R_2 and R_3 are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and $-(CHR)_L-$; L is an integer in the range from 1 to 6; Y is $-(CHR)_n-$, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is $-(CH_2)_n-$ and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen (claims 99-106, 184-185, and 189-190).

In another embodiment, the present invention is a composition comprising the compound described above and a transition metal catalyst, wherein the transition metal catalyst is a metal salt (claims 107-121 and 191).

In yet another embodiment, the present invention is an article of manufacture suitable as a container, wherein the article comprises a composition comprising the compound described above and a transition metal catalyst (claims 122-150 and 193-194).

In still another embodiment, the present invention is a layer suitable for scavenging oxygen, comprising the compound described above and a transition metal catalyst (claims 151-167 and 192).

In still a further embodiment, the present invention is a transesterification process of making the compound described above (claims 168-183 and 186-188).

VI. ISSUES ON APPEAL

A. Are claims 99-194 unpatentable under 35 U.S.C. §103(a) in view of Ching et al., U.S. Pat. No. 5,859,145 (hereinafter "Ching") and Nordstrom, U.S. Pat. No. 3,536,687 (hereinafter "Nordstrom")?

VII. GROUPING OF THE CLAIMS

Claims 99-106, 184-185, and 189-190 can be considered as a first group.

Claims 107-167 and 191-194 can be considered as a second group.

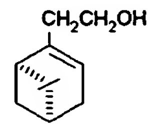
Claims 168-183 and 186-188 can be considered as a third group.

The claims in each of the above groups stand or fall together. The reasons why these three groups are separately patentable are explained below in the Argument.

VIII. ARGUMENT

A. Nonobviousness of claims 99-194 over Ching and Nordstrom

The Examiner contends that claims 99-194 are unpatentable over Ching and Nordstrom. Ching relates to polymers having ethylenic backbones (as defined at col. 8, lines 58-67) and pendant benzylic, allylic, ether-containing, or functional moieties (col. 8, lines 49-51). The pendant allylic moieties may be cyclic (col. 17, lines 26-30 and 40-44). The polymers may be a component of a composition which also comprises a transition metal salt (col. 14, lines 18-40). The polymer may be prepared by esterification or transesterification of a polymer intermediate comprising acid groups pendant to the polymer backbone with an allylic-containing alcohol (col. 20, lines 36-47). The compositions of Ching are useful in making packaging articles, layers

thereof, or films (col. 26, lines 29-52; col. 27, lines 54-65). The only example prepared by Ching of a polymer having a cyclic pendant group with allylic hydrogen is a polymer prepared by transesterifying ethylene/methyl acrylate copolymer with Nopol, a bicyclic compound having the following structure:  (Example 44, col. 40, lines 40-64). Ching did not prepare polymers having a monocyclic olefinic pendant group.

Nordstrom teaches polymerization of cyclohexenyl alkyl alcohol esters of α,β-unsaturated acids (col. 1, lines 24-27). Acrylic polymers and copolymers comprising the cyclohexenyl moiety are prepared by esterification of the unsaturated acid with the cyclohexenyl alkyl alcohol, followed by polymerization of the ester (col. 5, lines 55-62; col. 3, lines 40-67). The term "copolymer" applies to terpolymers, as indicated by Examples 3-13 (cols. 4-5). The terpolymers disclosed by Nordstrom comprise methyl methacrylate, ethyl acrylate, and a cyclohexenyl-containing unit (Examples 3-13). A composition comprising such a terpolymer and cobalt naphthenate, when applied as a film to a metal plate and air dried, produced a film which was partially (48%-67%) resistant to extraction by a benzene solvent (Table I, Examples 6, 7, and 10). This resistance to extraction was attributed to cross-linking of the terpolymer by oxidation of the terpolymer in air during curing (air drying) of the film (col. 5, lines 65-75).

The Examiner alleged that it would be routine matter for one of ordinary skill in the art to use the terpolymer of Nordstrom in the compositions, etc., of Ching. Applicants consider this allegation to be incorrect for a variety of reasons relevant to the various groups of claims set forth above.

First, claims 99-106, 184-185, and 189-190 claim a polymer comprising (i) an ethylenic group (the group with subscript Q in structure II), (ii) a styrenic, acrylic, or similar group (the

group with subscript T in structure II), and (iii) a group with an ethylenic backbone, a linking group X, and a cyclohexenyl-containing moiety (the group with subscript P in structure II).

Ching reports a polymer produced by transesterification of poly(ethylene/methyl acrylate) with Nopol, a bicyclic alcohol, the structure of which is set forth above (Example 44, col. 40, lines 40-64). Given the observation that transesterification was not complete (i.e., conversion of methyl acrylate groups was from 14% to about 73%, Table 4, col. 40), Ching produced an ethylene/methyl acrylate/Nopol ester terpolymer. The Nopol ester unit does not have the structure of the cyclohexenyl-containing group of structure II of the present invention. Nordstrom reports a methyl methacrylate/ethyl acrylate/cyclohexenyl-containing unit polymer (col. 5, Examples 6, 7, and 10).

To arrive at the terpolymer of the present claims, in light of Ching and Nordstrom, one of ordinary skill in the art would have to conclude either (a) the Nopol ester unit of the terpolymer of Ching could be replaced with a cyclohexenyl-containing unit of Nordstrom, with both a motivation to combine the references and a reasonable expectation of success, or (b) either the methyl methacrylate or the ethyl acrylate unit of the terpolymer of Nordstrom could be replaced with an ethylene unit of Ching, with both a motivation to combine the references and a reasonable expectation of success. Neither of these conclusions can be drawn from the teachings of Ching and Nordstrom.

Ching refers at several points to "cyclic moieties that contain allylic hydrogen" (*e.g.*, col. 17, line 42). However, the only specific example in Ching of a cyclic moiety that contains allylic hydrogen is Nopol. As discussed above, Nopol is a *bicyclic* moiety, not a *monocyclic* moiety. Therefore, it is not apparent that Ching envisioned the possibility of monocyclic moieties

containing allylic hydrogen (such as the cyclohexenyl-containing moiety of Nordstrom) in Ching's terpolymers.

The Examiner pointed to Nordstrom's teaching of polymers comprising cyclohexenyl-containing units cross-linking upon oxidizing in air as indicating that one of ordinary skill in the art would recognize cyclohexenyl-containing units as being capable of reacting with oxygen. Though true that cyclohexenyl-containing units would be recognized as being capable of reacting with oxygen, there is no indication in Nordstrom that the rate of oxygen reaction would be fast enough to be of interest to one of ordinary skill in the art. The terpolymers of Nordstrom comprised 10 mol% cyclohexenyl-containing units (col. 5, Table I), implying that a typical polymer macromolecule contained more than one, most likely ten or more, cyclohexenyl-containing units. (The conclusion of ten or more cyclohexenyl-containing units is derived from an assumption of a polymer macromolecule containing at least 100 units, of which 10 mol% were cyclohexenyl-containing units). Assuming that a first polymer macromolecule would not be extracted by the extraction test of Nordstrom if it were crosslinked to a second polymer macromolecule, and crosslinking involved one oxygen-mediated reaction between a cyclohexenyl-containing unit of the first polymer macromolecule and a cyclohexenyl-containing unit of the second polymer macromolecule, the maximum extent of oxygen reactivity of the terpolymers of Nordstrom may have been as low as 6.7% of all cyclohexenyl-containing units. (This conclusion is drawn from the assumption of ten cyclohexenyl-containing units per macromolecule, of which as few as 1 (or 10%) may have participated in crosslinking among 67% of all macromolecules in the film. By multiplication, 10% of 67% is 6.7%). This potentially very low degree of oxygen reactivity of the cyclohexenyl-containing units of Nordstrom, after 28 days of oxygen exposure at room temperature in the presence not only of cobalt naphthenate but

also of methyl ethyl ketone peroxide, "a secondary catalyst" added to "further hasten the curing [*i.e.*, reaction with oxygen]," would not lead one of ordinary skill in the art to consider the use of the cyclohexenyl-containing units of Nordstrom in the terpolymers of Ching. The oxygen reactivity of the Nopol-containing terpolymers of Ching is much higher. Consider Ching's Polymer P, Examples 44 and 46, Table 8, cols. 40-42. This polymer originally comprised 24 wt% methyl acrylate, or roughly 8 mol% methyl acrylate, balance ethylene. After transesterification with Nopol to the extent of 14% conversion of methyl acrylate, it comprised about 1 mol% Nopol ester units, or roughly 7 wt% Nopol ester units. Table 8 of Ching (col. 42, lines 36-50) shows that, after 24 days of oxygen exposure at room temperature in the presence of cobalt neodecanoate (and *not* methyl ethyl ketone peroxide), the polymer had consumed 50.65 mL O_2/g of polymer, which corresponds to about 700 mL O_2/g of Nopol ester units. One gram of Nopol ester units of the polymer of Ching would represent about 4 mmol Nopol ester units. About 700 mL O_2 represents, assuming oxygen is an ideal gas with a volume of 22.4 L/mol, about 30 mmol oxygen. In other words, 1 Nopol ester unit of the polymer of Ching consumed about 7.5 oxygen molecules, which is far greater than the amount of oxygen that may have been consumed by the polymer of Nordstrom. Therefore, there was no reasonable expectation that the monocyclic cyclohexenyl moieties of Nordstrom would be effective in the terpolymers of Ching, and therefore there was no motivation to combine Nordstrom with Ching.

Next, considering the use of ethylene units of Ching in place of acrylate or methacrylate units in the terpolymer of Nordstrom, there is no motivation to combine Ching with Nordstrom. Nordstrom is directed to acrylic resins suitable for use in coating compositions (col. 1, lines 28-31). Ching summarizes the art by pointing to ethylene polymers and copolymers with alkyl acrylates or methacrylates as being "common thermoplastic materials used in packaging" (col. 6,

lines 44-47). One of ordinary skill in the art, when preparing acrylic resins for coating applications according to Nordstrom, would not be motivated to use ethylene units in the acrylic resins. Therefore, there is no motivation to combine the references.

Given that neither of the lines of reasoning which would render claims 99-106, 184-185, and 189-190 obvious over Ching and Nordstrom are valid for the reasons discussed above, claims 99-106, 184-185, and 189-190 are patentable.

Second, claims 107-167 and 191-194 are directed to compositions comprising (i) a transition metal catalyst and (ii) the terpolymer described above, layers comprising the composition, or a packaging article comprising the transition metal catalyst and the terpolymer. These claims are separately patentable from claims 99-106, 184-185, and 189-190 on the grounds that a hypothetical finding of a lack of patentability of claims directed to the terpolymer would have no bearing on whether a composition, layer, or packaging article comprising a transition metal catalyst and the terpolymer is patentable.

For the reasons discussed above, in reference to claims 99-106, 184-185, and 189-190, claims to the terpolymer are patentable over the references, and therefore, claims to a composition comprising the terpolymer are patentable over the references as well.

In addition, the teachings of the references concerning a transition metal catalyst represent a further point of patentability for the present claims. Nordstrom discusses the oxidation of cyclohexenyl moieties, but in the only Examples reported by Nordstrom, this oxidation required the presence of both cobalt naphthenate and methyl ethyl ketone peroxide. Therefore, Nordstrom's only teaching concerning oxygen-reactive compositions is for compositions comprising the terpolymer of Nordstrom, a cobalt salt, *and* methyl ethyl ketone peroxide. Nordstrom does not suggest that a composition comprising cyclohexenyl moieties but

not comprising methyl ethyl ketone peroxide would be effective in promoting oxidation, and thus does not suggest the present invention as a whole. Ching, in contrast, teaches that cobalt alone is an effective oxidation catalyst for a polymer comprising Nopol moieties, which was known to be highly reactive from Ching's Example 44, but does not suggest that a polymer comprising cyclohexenyl moieties (which, for the reasons described above, would not have been expected by one of ordinary skill in the art to be as reactive as a polymer comprising Nopol moieties) would be effective in oxidation when catalyzed by cobalt alone. As a result, neither reference, alone or in combination, teaches or suggests the claimed invention as a whole.

For both of these reasons, claims 107-167 and 191-194 are patentable over Ching and Nordstrom.

Third, claims 168-183 and 186-188 are directed to transesterifying an ethylene copolymer with an alcohol comprising a cyclic olefinic group to prepare a terpolymer as recited by claims 99-106, 184-185, and 189-190. These claims are separately patentable from the claims directed to the terpolymer because a hypothetical finding of unpatentability of claims directed to the terpolymer would have no bearing on whether a method of preparing the terpolymer is patentable. Also, a hypothetical finding of unpatentability of claims directed to the method of preparing the terpolymer would have no bearing on whether the terpolymer is patentable.

Because the terpolymer is patentable over the references, for the reasons set forth above, a method of preparing the terpolymer must also be patentable over the references. Therefore, claims 99-106, 184-185, and 189-190 are patentable over the references.

For all of the foregoing reasons, as applied to each of the three groups of claims, the rejection of claims 99-194 as being unpatentable over Ching and Nordstrom should be reversed.

IX. CONCLUSION

The rejection of claims 99-194 should be reversed.

Please date stamp and return the enclosed postcard to evidence receipt of this document.

Respectfully submitted,

Raymund F. Eich
Reg. No. 42,508

AGENT FOR APPLICANTS

WILLIAMS, MORGAN & AMERSON, P.C.
7676 Hillmont, Suite 250
Houston, Texas 77040
(713) 934-4065
(713) 934-7011 (fax)

October 15, 2002

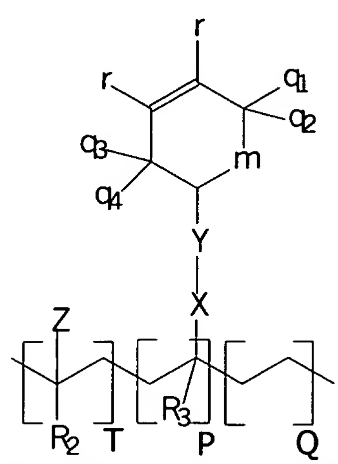
APPENDIX A

Claims Involved in This Appeal

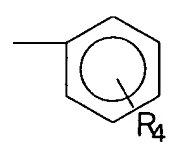
99. A compound, comprising a polymeric backbone, cyclic olefinic pendent groups and linking groups linking the olefinic pendent groups to the polymeric backbone,

wherein the polymeric backbone, linking groups and cyclic olefinic pendent groups comprise repeating units, each unit having a structure (II) as follows:

(II)



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; $-(C{=}O)OR_1$; $-O(C{=}O)R_1$; and an alkyl aryl group:



where R_4 is selected from the group consisting of $-CH_3$, ethyl, and hydrogen; R_1 is selected from the group consisting of hydrogen, methyl, ethyl, $-C_3H_7$ and $-C_4H_9$; R_2 and R_3 are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, $-(C{=}O)O-$, $-(C{=}O)NH-$, $-(C{=}O)S-$, $-O(C{=}O)-$ and $-(CHR)_L-$; L is an integer in the range from 1 to 6; Y is $-(CHR)_n-$, where n is an integer in the range from 0 to 12, R

being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is $-(CH_2)_n-$ and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen.

100. The compound of claim 99, wherein the polymeric backbone comprises monomers selected from the group consisting of ethylene and styrene.

101. The compound of claim 99, wherein the cyclic olefinic pendent groups are grafted onto the linking groups of the polymeric backbone by an esterification, transesterification, amidation or transamidation reaction.

102. The compound of claim 101, wherein the esterification, transesterification, amidation or transamidation reaction is a solution reaction or a reactive extrusion.

103. The compound of claim 101, wherein the esterification, transesterification, amidation or transamidation reaction is catalyzed by a catalyst selected from the group consisting of strong non-oxidizing acids, tertiary amines, Group I alkoxides, Group IVB alkoxides, and Group IVA organometallics.

104. The compound of claim 103, wherein the catalyst is selected from a group consisting of toluene sulfonic acid, sodium methoxide, tetrabutyl titanate, tetraisopropyl titanate, tetra-n-propyl-titanate, tetraethyl titanate, 2-hydroxy-pyridine and dibutyltin dilaurate.

105. The compound of claim 99, wherein the cyclic olefinic pendent groups are selected from the group consisting of cyclohexene-4-methylene radical, 1-methyl cyclohexene-4-methylene radical, 2-methyl cyclohexene-4-methylene radical, 5-methyl cyclohexene-4-methylene radical, 1,2-dimethyl cyclohexene-4-methylene radical, 1,5-dimethyl cyclohexene-4-methylene radical, 2,5-dimethyl cyclohexene-4-methylene radical, 1,2,5-trimethyl cyclohexene-4-methylene radical, cyclohexene-4-ethylene radical, 1-methyl cyclohexene-4-ethylene radical, 2-methyl cyclohexene-4-ethylene radical, 5-methyl cyclohexene-4-ethylene radical, 1,2-dimethyl

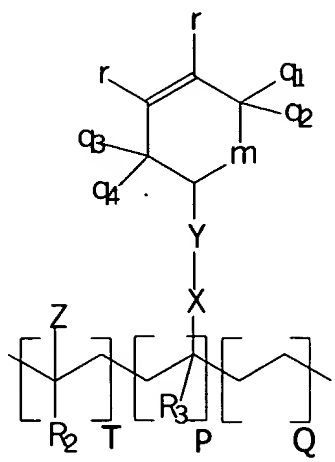
cyclohexene-4-ethylene radical, 1,5-dimethyl cyclohexene-4-ethylene radical, 2,5-dimethyl cyclohexene-4-ethylene radical, 1,2,5-trimethyl cyclohexene-4-ethylene radical, cyclohexene-4-propylene radical, 1-methyl cyclohexene-4-propylene radical, 2-methyl cyclohexene-4-propylene radical, 5-methyl cyclohexene-4-propylene radical, 1,2-dimethyl cyclohexene-4-propylene radical, 1,5-dimethyl cyclohexene-4-propylene radical, 2,5-dimethyl cyclohexene-4-propylene radical, 1,2,5-trimethyl cyclohexene-4-propylene radical, cyclopentene-4-methylene radical, 1-methyl cyclopentene-4-methylene radical, 3-methyl cyclopentene-4-methylene radical, 1,2-dimethyl cyclopentene-4-methylene radical, 3,5-dimethyl cyclopentene-4-methylene radical, 1,3-dimethyl cyclopentene-4-methylene radical, 2,3-dimethyl cyclopentene-4-methylene radical, 1,2,3-trimethyl cyclopentene-4-methylene radical, 1,2,3,5-tetramethyl cyclopentene-4-methylene radical, cyclopentene-4-ethylene radical, 1-methyl cyclopentene-4-ethylene radical, 3-methyl cyclopentene-4-ethylene radical, 1,2-dimethyl cyclopentene-4-ethylene radical, 3,5-dimethyl cyclopentene-4-ethylene radical, 1,3-dimethyl cyclopentene-4-ethylene radical, 2,3-dimethyl cyclopentene-4-ethylene radical, 1,2,3-trimethyl cyclopentene-4-ethylene radical, 1,2,3,5-tetramethyl cyclopentene-4-ethylene radical, cyclopentene-4-propylene radical, 1-methyl cyclopentene-4-propylene radical, 3-methyl cyclopentene-4-propylene radical, 1,2-dimethyl cyclopentene-4-propylene radical, 3,5-dimethyl cyclopentene-4-propylene radical, 1,3-dimethyl cyclopentene-4-propylene radical, 2,3-dimethyl cyclopentene-4-propylene radical, 1,2,3-trimethyl cyclopentene-4-propylene radical, and 1,2,3,5-tetramethyl cyclopentene-4-propylene radical.

106. The compound of claim 99, wherein the compound is an ethylene/methyl acrylate/cyclohexenyl methyl acrylate terpolymer.

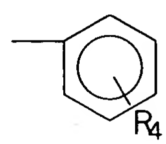
107. An oxygen scavenging composition, comprising a compound comprising a polymeric backbone, cyclic olefinic pendent groups, and linking groups linking the olefinic pendent groups to the polymeric backbone, and a transition metal catalyst;

wherein the transition metal catalyst is a metal salt, and wherein the polymeric backbone, linking groups and cyclic olefinic pendent groups comprise repeating units, each unit having a structure (II) as follows:

(II)



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; -(C=O)OR$_1$; -O(C=O)R$_1$; and an alkyl aryl group:



where R$_4$ is selected from the group consisting of –CH$_3$, ethyl, and hydrogen; R$_1$ is selected from the group consisting of hydrogen, methyl, ethyl, -C$_3$H$_7$ and -C$_4$H$_9$; R$_2$ and R$_3$ are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and -(CHR)$_L$-; L is an integer in the range from 1 to 6; Y is -(CHR)$_n$-, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is –(CH$_2$)$_n$- and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen.

108. A composition according to claim 107, wherein the polymeric backbone is ethylenic and the linking groups are selected from the group consisting of:

-O-(CHR)$_n$-; -(C=O)-O-(CHR)$_n$-; -NH-(CHR)$_n$-; -O-(C=O)-(CHR)$_n$-;

-(C=O)-NH-(-CHR)$_n$-; and -(C=O)-O-CHOH-CH$_2$-O-;

wherein R is hydrogen or an alkyl group selected from the group consisting of methyl, ethyl, propyl and butyl groups and where n is an integer in the range from 1 to 12.

109. The composition of claim 107, wherein the polymeric backbone comprises monomers selected from the group consisting of ethylene and styrene.

110. The composition of claim 107, wherein the cyclic olefinic pendent groups are grafted onto the linking groups of the polymeric backbone by a esterification, transesterification, amidation or transamidation reaction.

111. The composition of claim 110, wherein the esterification, transesterification, amidation or transamidation reaction is a solution reaction or a reactive extrusion.

112. The composition of claim 110, wherein the esterification, transesterification, amidation or transamidation reaction is catalyzed by a catalyst selected from the group consisting of strong non-oxidizing acids, tertiary amines, Group I alkoxides, Group IVB alkoxides, and Group IVA organometallics.

113. The composition of claim 112, wherein the catalyst is selected from a group consisting of toluene sulfonic acid, sodium methoxide, tetrabutyl titanate, tetraisopropyl titanate, tetra-n-propyl-titanate, tetraethyl titanate, 2-hydroxy-pyridine and dibutyltin dilaurate.

114. The composition of claim 107, wherein the cyclic olefinic pendent groups are selected from the group consisting of cyclohexene-4-methylene radical, 1-methyl cyclohexene-4-methylene radical, 2-methyl cyclohexene-4-methylene radical, 5-methyl cyclohexene-4-methylene radical, 1,2-dimethyl cyclohexene-4-methylene radical, 1,5-dimethyl cyclohexene-4-methylene radical, 2,5-dimethyl cyclohexene-4-methylene radical, 1,2,5-trimethyl cyclohexene-4-methylene radical, cyclohexene-4-ethylene radical, 1-methyl cyclohexene-4-ethylene radical, 2-methyl cyclohexene-4-ethylene radical, 5-methyl cyclohexene-4-ethylene radical, 1,2-dimethyl cyclohexene-4-ethylene radical, 1,5-dimethyl cyclohexene-4-ethylene radical, 2,5-dimethyl

cyclohexene-4-ethylene radical, 1,2,5-trimethyl cyclohexene-4-ethylene radical, cyclohexene-4-propylene radical, 1-methyl cyclohexene-4-propylene radical, 2-methyl cyclohexene-4-propylene radical, 5-methyl cyclohexene-4-propylene radical, 1,2-dimethyl cyclohexene-4-propylene radical, 1,5-dimethyl cyclohexene-4-propylene radical, 2,5-dimethyl cyclohexene-4-propylene radical, 1,2,5-trimethyl cyclohexene-4-propylene radical, cyclopentene-4-methylene radical, 1-methyl cyclopentene-4-methylene radical, 3-methyl cyclopentene-4-methylene radical, 1,2-dimethyl cyclopentene-4-methylene radical, 3,5-dimethyl cyclopentene-4-methylene radical, 1,3-dimethyl cyclopentene-4-methylene radical, 2,3-dimethyl cyclopentene-4-methylene radical, 1,2,3-trimethyl cyclopentene-4-methylene radical, 1,2,3,5-tetramethyl cyclopentene-4-methylene radical, cyclopentene-4-ethylene radical, 1-methyl cyclopentene-4-ethylene radical, 3-methyl cyclopentene-4-ethylene radical, 1,2-dimethyl cyclopentene-4-ethylene radical, 3,5-dimethyl cyclopentene-4-ethylene radical, 1,3-dimethyl cyclopentene-4-ethylene radical, 2,3-dimethyl cyclopentene-4-ethylene radical, 1,2,3-trimethyl cyclopentene-4-ethylene radical, 1,2,3,5-tetramethyl cyclopentene-4-ethylene radical, cyclopentene-4-propylene radical, 1-methyl cyclopentene-4-propylene radical, 3-methyl cyclopentene-4-propylene radical, 1,2-dimethyl cyclopentene-4-propylene radical, 3,5-dimethyl cyclopentene-4-propylene radical, 1,3-dimethyl cyclopentene-4-propylene radical, 2,3-dimethyl cyclopentene-4-propylene radical, 1,2,3-trimethyl cyclopentene-4-propylene radical, and 1,2,3,5-tetramethyl cyclopentene-4-propylene radical.

115. The composition of claim 107, wherein the compound is an ethylene/methyl acrylate/cyclohexenyl methyl acrylate terpolymer.

116. The composition of claim 107, wherein odor and taste characteristics of products packaged with material comprised of the composition are not adulterated as a result of oxidation of the composition.

117. The composition of claim 107, wherein there is no significant fragmentation of the olefinic pendent groups and linking groups from the polymeric backbone as a result of oxidation of the composition.

118. The composition of claim 107, wherein the metal in the metal salt is cobalt.

119. The composition according to claim 118, wherein the metal salt is selected from the group consisting of cobalt neodecanoate, cobalt 2-ethylhexanoate, cobalt oleate and cobalt stearate.

120. The composition of claim 107, further comprising at least one triggering material to enhance initiation of oxygen scavenging.

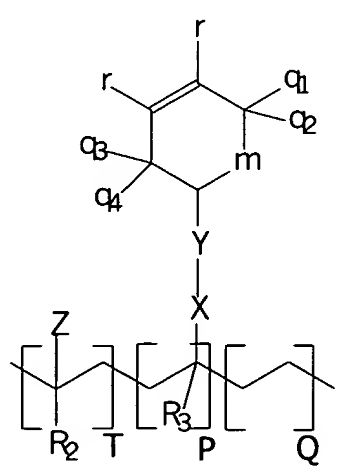
121. The composition of claim 119, wherein the triggering material is a photo initiator.

122. An article of manufacture suitable as a container, the container inhibiting oxidation of contents of the container by removing oxygen from the container and by inhibiting ingress of oxygen into the container from outside the container,

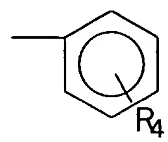
wherein the article comprises an oxygen scavenging composition which comprises:

(a) a compound comprising a polymeric backbone, cyclic olefinic pendant groups, and linking groups linking the olefinic pendant groups to the backbone, wherein the polymeric backbone, linking groups and cyclic olefinic pendent groups comprise repeating units, each unit having a structure (II) as follows:

(II)



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; -(C=O)OR$_1$; -O(C=O)R$_1$; and an alkyl aryl group:



where R$_4$ is selected from the group consisting of –CH$_3$, ethyl, and hydrogen; R$_1$ is selected from the group consisting of hydrogen, methyl, ethyl, -C$_3$H$_7$ and -C$_4$H$_9$; R$_2$ and R$_3$ are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and -(CHR)$_L$-; L is an integer in the range from 1 to 6; Y is -(CHR)$_n$-, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q$_1$, q$_2$, q$_3$, q$_4$, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is -(CH$_2$)$_n$- and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q$_1$, q$_2$, q$_3$ and q$_4$ is hydrogen; and

(b) a transition metal catalyst.

123. The article of manufacture of claim 122, wherein the polymeric backbone is ethylenic and the linking groups are selected from the group consisting of:

-O-(CHR)$_n$-; -(C=O)-O-(CHR)$_n$-; -NH-(CHR)$_n$-; -O-(C=O)-(CHR)$_n$-;

-(C=O)-NH-(-CHR)$_n$-; and -(C=O)-O-CHOH-CH$_2$-O-;

wherein R is hydrogen or an alkyl group selected from the group consisting of methyl, ethyl, propyl and butyl groups and where n is an integer in the range from 1 to 12.

124. The article of manufacture of claim 122, wherein the polymeric backbone comprises monomers selected from the group consisting of ethylene and styrene.

125. The article of manufacture of claim 122, wherein the cyclic olefinic pendent groups are grafted onto the linking groups of the polymeric backbone by a esterification, transesterification, amidation or transamidation reaction.

126. The article of manufacture of claim 125, wherein the esterification, transesterification, amidation or transamidation reaction is a solution reaction or a reactive extrusion.

127. The article of manufacture of claim 125, wherein the esterification, transesterification, amidation or transamidation reaction is catalyzed by a catalyst selected from the group consisting of strong non-oxidizing acids, tertiary amines, Group I alkoxides, Group IVB alkoxides, and Group IVA organometallics.

128. The article of manufacture of claim 127, wherein the catalyst is selected from the group consisting of toluene sulfonic acid, sodium methoxide, tetrabutyl titanate, tetraisopropyl titanate, tetra-n-propyl-titanate, tetraethyl titanate, 2-hydroxy-pyridine and dibutyltin dilaurate.

129. The article of manufacture of claim 122, wherein the cyclic olefinic pendent groups are selected from the group consisting of cyclohexene-4-methylene radical, 1-methyl cyclohexene-4-methylene radical, 2-methyl cyclohexene-4-methylene radical, 5-methyl cyclohexene-4-methylene radical, 1,2-dimethyl cyclohexene-4-methylene radical, 1,5-dimethyl cyclohexene-4-methylene radical, 2,5-dimethyl cyclohexene-4-methylene radical, 1,2,5-trimethyl cyclohexene-4-methylene radical, cyclohexene-4-ethylene radical, 1-methyl cyclohexene-4-ethylene radical, 2-methyl cyclohexene-4-ethylene radical, 5-methyl cyclohexene-4-ethylene radical, 1,2-dimethyl cyclohexene-4-ethylene radical, 1,5-dimethyl cyclohexene-4-ethylene radical, 2,5-dimethyl cyclohexene-4-ethylene radical, 1,2,5-trimethyl cyclohexene-4-ethylene radical, cyclohexene-4-propylene radical, 1-methyl cyclohexene-4-propylene radical, 2-methyl cyclohexene-4-propylene radical, 5-methyl cyclohexene-4-propylene radical, 1,2-dimethyl cyclohexene-4-propylene radical, 1,5-dimethyl cyclohexene-4-propylene radical, 2,5-dimethyl cyclohexene-4-propylene radical, 1,2,5-trimethyl cyclohexene-4-propylene radical, cyclopentene-4-methylene radical, 1-methyl cyclopentene-4-methylene radical, 3-methyl cyclopentene-4-methylene radical, 1,2-dimethyl cyclopentene-4-methylene radical, 3,5-dimethyl cyclopentene-4-methylene radical, 1,3-dimethyl cyclopentene-4-methylene radical, 2,3-dimethyl cyclopentene-4-methylene radical, 1,2,3-trimethyl cyclopentene-4-methylene radical, 1,2,3,5-tetramethyl cyclopentene-4-methylene radical, cyclopentene-4-ethylene radical, 1-methyl cyclopentene-4-ethylene radical, 3-methyl

cyclopentene-4-ethylene radical, 1,2-dimethyl cyclopentene-4-ethylene radical, 3,5-dimethyl cyclopentene-4-ethylene radical, 1,3-dimethyl cyclopentene-4-ethylene radical, 2,3-dimethyl cyclopentene-4-ethylene radical, 1,2,3-trimethyl cyclopentene-4-ethylene radical, 1,2,3,5-tetramethyl cyclopentene-4-ethylene radical, cyclopentene-4-propylene radical, 1-methyl cyclopentene-4-propylene radical, 3-methyl cyclopentene-4-propylene radical, 1,2-dimethyl cyclopentene-4-propylene radical, 3,5-dimethyl cyclopentene-4-propylene radical, 1,3-dimethyl cyclopentene-4-propylene radical, 2,3-dimethyl cyclopentene-4-propylene radical, 1,2,3-trimethyl cyclopentene-4-propylene radical, and 1,2,3,5-tetramethyl cyclopentene-4-propylene radical.

130. The article of manufacture of claim 122, wherein the compound is an ethylene/methyl acrylate/cyclohexenyl methyl acrylate terpolymer.

131. The article of manufacture according to claim 122, wherein the transition metal catalyst is a metal salt.

132. The article of manufacture according to claim 131, wherein the metal in the metal salt is cobalt.

133. The article of manufacture of according to claim 132, wherein the metal salt is selected from the group consisting of cobalt neodecanoate, cobalt 2-ethylhexanoate, cobalt oleate and cobalt stearate.

134. The article of manufacture of claim 122, further comprising at least one triggering material to enhance initiation of oxygen scavenging.

135. The article of manufacture of claim 134, wherein the triggering material is a photoinitiator.

136. The article of manufacture of claim 122, wherein odor and taste characteristics of products packaged with material comprised of the composition are not adulterated as a result of oxidation of the composition.

137. The article of manufacture of claim 122, wherein there is no significant fragmentation of the olefinic pendent groups and linking groups from the polymeric backbone as a result of oxidation of the composition.

138. The article of manufacture of claim 122 wherein the article is a package.

139. The article of manufacture of claim 138, wherein the package comprises a flexible film having a thickness of at most 10 mil or a flexible sheet having a thickness of at least 10 mil.

140. The article of manufacture of claim 138, wherein the oxygen scavenging system of the package comprises at least one additional layer selected from among oxygen barrier layers, polymeric selective layers, and heat seal layers.

141. The article of manufacture of claim 138, wherein the article is a package with a food product located within the package.

142. The article of manufacture of claim 138, wherein the article is a package for packaging a cosmetic, chemical, electronic device, pesticide or a pharmaceutical composition.

143. A multi-layer film comprising the article of manufacture according to claim 122, and at least one additional functional layer.

144. The multi-layer film according to claim 143, wherein at least one additional layer is selected from among oxygen barrier layers, polymeric selective barrier layers, structural layers and heat seal layers.

145. The multi-layer film according to claim 143, wherein the at least one additional layer is an oxygen barrier layer.

146. The multi-layer film according to claim 145, further comprising at least one polymeric selective barrier layer.

147. The multi-layer film according to claim 145, further comprising at least one heat seal layer.

148. The multi-layer film according to claim 145, further comprising at least one structural layer.

149. The article of claim 122, wherein the article is a rigid container, sealing gasket, patch, container closure device, bottle cap, bottle cap insert or molded or thermoformed shape.

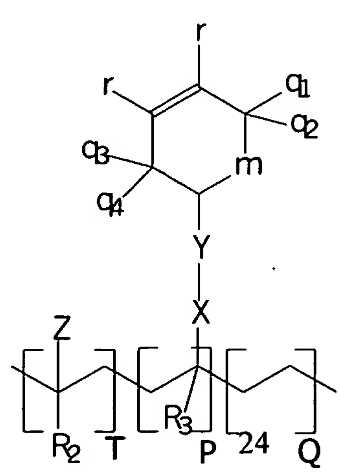
150. The article of claim 149, wherein the molded or thermoformed shape is a bottle or tray.

151. A layer suitable for scavenging oxygen, comprising:

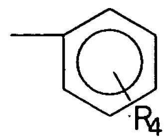
(a) a compound comprising a polymeric backbone, cyclic olefinic pendent groups and linking groups linking the olefinic pendent groups to the polymeric backbone,

wherein the polymeric backbone, linking groups and cyclic olefinic pendent groups comprise repeating units, each unit having a structure (II) as follows:

(II)



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; -(C=O)OR$_1$; -O(C=O)R$_1$; and an alkyl aryl group:



where R$_4$ is selected from the group consisting of –CH$_3$, ethyl, and hydrogen; R$_1$ is selected from the group consisting of hydrogen, methyl, ethyl, -C$_3$H$_7$ and -C$_4$H$_9$; R$_2$ and R$_3$ are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and -(CHR)$_L$-; L is an integer in the range from 1 to 6; Y is -(CHR)$_n$-, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is –(CH$_2$)$_n$- and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen; and

(b) a transition metal catalyst.

152. The layer of claim 151, wherein odor and taste characteristics of products packaged with material comprised of the layer are not adulterated as a result of oxidation of the layer.

153. The layer of claim 151, wherein there is no significant fragmentation of the olefinic pendent groups and linking groups from the polymeric backbone as a result of oxidation of the layer.

154. A layer according to claim 151, wherein the transition metal catalyst is a metal salt.

155. A layer according to claim 154, wherein the transition metal in the metal salt is cobalt.

156. A layer according to claim 154, wherein the metal salt selected from the group consisting of cobalt neodecanoate, cobalt 2-ethylhexanoate, cobalt oleate and cobalt stearate.

157. A layer according to claim 151, wherein said layer in addition comprises polymeric diluent.

158. A layer according to claim 157, wherein said diluent is a thermoplastic polymer.

159. A layer according to claim 151, wherein said layer is adjacent to one or more additional layers.

160. A layer according to claim 159, wherein at least one additional layer is an oxygen barrier.

161. A layer according to claim 160, wherein said oxygen barrier comprises at least one material selected from the group consisting of poly(ethylene-vinyl alcohol), polyacrylonitrile, poly(vinyl chloride), polyamides, poly(vinylidene dichloride), poly(ethylene terephthalate), silica, metal foil and metalized polymeric films.

162. A layer according to claim 159, wherein one or more of said additional layer or layers is coextruded with said layer.

163. A layer according to claim 159, wherein one or more of said additional layer or layers is laminated onto said layer.

164. A layer according to claim 159, wherein one or more of said additional layer or layers is coated onto said layer.

165. A layer according to claim 159, wherein said layer is flexible.

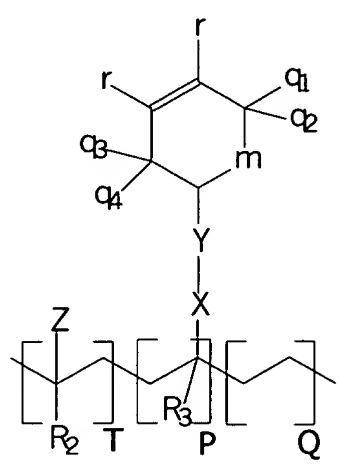
166. A layer according to claim 159, wherein said layer is transparent.

167. An article for packaging wherein the article comprises a layer according to claim 151.

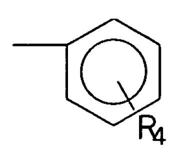
168. A process of making a polymer material by a process comprising transesterification of an ethylene copolymer with an alcohol comprising a cyclic olefinic group, wherein the polymer material that is produced comprises a polymer backbone, cyclic olefinic pendant groups, and linking groups linking the backbone with the pendant groups;

wherein the polymeric backbone, linking groups and cyclic olefinic pendent groups comprise repeating units, each unit having a structure (II) as follows:

(II)



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; -(C=O)OR$_1$; -O(C=O)R$_1$; and an alkyl aryl group:



where R$_4$ is selected from the group consisting of $-CH_3$, ethyl, and hydrogen; R$_1$ is selected from the group consisting of hydrogen, methyl, ethyl, $-C_3H_7$ and $-C_4H_9$; R$_2$ and R$_3$ are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-,

-NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and $-(CHR)_L-$; L is an integer in the range from 1 to 6; Y is $-(CHR)_n-$, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is $-(CH_2)_n-$ and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen.

169. The process of claim 168, wherein the process comprises the steps of:

(a) selecting at least one polymer from the group consisting of ethylene/maleic anhydride, ethylene/acrylic acid, ethylene/methacrylic acid, ethylene/methyl acrylate, ethylene/ethyl acrylate, and ethylene/butyl acrylate, and at least one transesterifying compound selected from the group consisting of cyclohexene-4-methanol, 1-methyl cyclohexene-4-methanol, 2-methyl cyclohexene-4-methanol, 5-methyl cyclohexene-4-methanol, 1,2-dimethyl cyclohexene-4-methanol, 1,5-dimethyl cyclohexene-4-methanol, 2,5-dimethyl cyclohexene-4-methanol, 1,2,5-trimethyl cyclohexene-4-methanol, cyclohexene-4-ethanol, 1-methyl cyclohexene-4-ethanol, 2-methyl cyclohexene-4-ethanol, 5-methyl cyclohexene-4-ethanol, 1,2-dimethyl cyclohexene-4-ethanol, 1,5-dimethyl cyclohexene-4-ethanol, 2,5-dimethyl cyclohexene-4-ethanol, 1,2,5-trimethyl cyclohexene-4-ethanol, cyclohexene-4-propanol, 1-methyl cyclohexene-4-propanol, 2-methyl cyclohexene-4-propanol, 5-methyl cyclohexene-4-propanol, 1,2-dimethyl cyclohexene-4-propanol, 1,5-dimethyl cyclohexene-4-propanol, 2,5-dimethyl cyclohexene-4-propanol, 1,2,5-trimethyl cyclohexene-4-propanol, cyclopentene-4-methanol, 1-methyl cyclopentene-4-methanol, 3-methyl cyclopentene-4-methanol, 1,2-dimethyl cyclopentene-4-methanol, 3,5-dimethyl cyclopentene-4-methanol, 1,3-dimethyl cyclopentene-4-methanol, 2,3-dimethyl cyclopentene-4-methanol, 1,2,3-trimethyl cyclopentene-4-methanol, 1,2,3,5-tetramethyl cyclopentene-4-methanol, cyclopentene-4-ethanol, 1-methyl cyclopentene-4-ethanol, 3-methyl cyclopentene-4-ethanol, 1,2-dimethyl cyclopentene-4-ethanol, 3,5-dimethyl cyclopentene-4-ethanol, 1,3-dimethyl cyclopentene-4-ethanol, 2,3-dimethyl cyclopentene-4-ethanol, 1,2,3-trimethyl cyclopentene-4-ethanol, 1,2,3,5-

tetramethyl cyclopentene-4-ethanol, cyclopentene-4-propanol, 1-methyl cyclopentene-4-propanol, 3-methyl cyclopentene-4-propanol, 1,2-dimethyl cyclopentene-4-propanol, 3,5-dimethyl cyclopentene-4-propanol, 1,3-dimethyl cyclopentene-4-propanol, 2,3-dimethyl cyclopentene-4-propanol, 1,2,3-trimethyl cyclopentene-4-propanol, and 1,2,3,5-tetramethyl cyclopentene-4-propanol, and combining the at least one polymer and the at least one transesterifying compound;

(b) heating the polymer and transesterifying compound selected in (a) to form a polymer melt;

(c) processing the melt in an extruder under transesterification conditions with transesterification catalysts and antioxidants protecting the melt from oxidation during extrusion, so that the polymer melt undergoes exchange of alkyl groups of polymeric esters with cyclic olefin pendent groups; and

(d) removing volatile organic products and by-products from the melt.

170. The process of claim 169, wherein the polymeric backbone is ethylenic and the linking groups are selected from the group consisting of:

$-O-(CHR)_n-$; $-(C=O)-O-(CHR)_n-$; $-NH-(CHR)_n-$;
$-O-(C=O)-(CHR)_n-$; $-(C=O)-NH-(-CHR)_n-$; and $-(C=O)-O-CHOH-CH_2-O-$;

where R is hydrogen or an alkyl group selected from the group consisting of methyl, ethyl, propyl and butyl groups and where n is an integer in the range from 1 to 12.

171. The process of claim 169, wherein the polymeric backbone is ethylenic backbone and the linking group is:

$-(C=O)-NH-(CHR)_n$

where R is hydrogen or an alkyl group selected from the group consisting of methyl, ethyl, propyl and butyl groups and where n is an integer in the range from 1 to 12.

172. The process of claim 168, further comprising adding to the polymer material a transition metal catalyst.

173. The process of claim 172, wherein the transition metal catalyst is a metal salt.

174. The process of claim 173, wherein the metal in the metal salt is cobalt.

175. The process of claim 173, wherein the metal salt is selected from the group consisting of cobalt neodecanoate, cobalt 2-ethylhexanoate, cobalt oleate and cobalt stearate.

176. The process of claim 168, further comprising adding to the polymer material at least one triggering material to enhance initiation of oxygen scavenging.

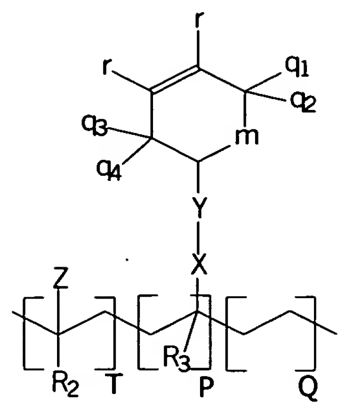
177. The process of claim 176, wherein the triggering material is a photoinitiator.

178. The process of claim 168, wherein the reaction is a solution reaction or a reactive extrusion.

179. The process of claim 168, wherein the transesterification reaction is catalyzed by a catalyst selected from the group consisting of strong non-oxidizing acids, tertiary amines, Group I alkoxides, Group IVB alkoxides, Group IVA organometallics.

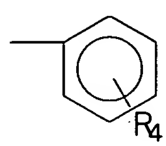
180. The process of claim 179, wherein the catalyst is selected from the group consisting of toluene sulfonic acid, sodium methoxide, tetrabutyl titanate, tetraisopropyl titanate, tetra-n-propyl-titanate, tetraethyl titanate, 2-hydroxy-pyridine and dibutyltin dilaurate.

181. The process of claim 168, wherein the backbone, linking groups and cyclic olefin pendent groups comprise repeating units, each unit having a structure (II) as follows:



(II)

wherein P + T + Q is 100 mol % of the total composition; P, T, and Q are each greater than 0; Z is selected from the group consisting of an aryl group, -(C=O)OR$_1$, -O(C=O)R$_1$ and an alkyl aryl group:



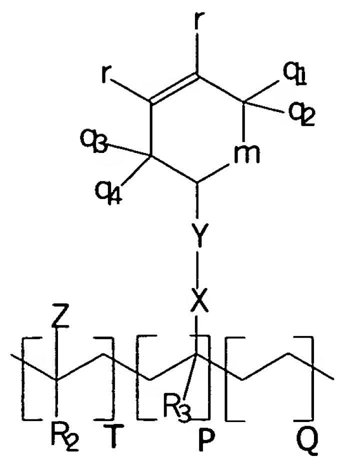
where R$_4$ is selected from the group consisting of –H, -CH$_3$ and -C$_2$H$_5$; R$_1$ is selected from the group consisting of -H, -CH$_3$, -C$_2$H$_5$, -C$_3$H$_5$ and -C$_4$H$_7$; R$_2$ and R$_3$ is selected from the group consisting of -H and CH$_3$; X is selected from the group consisting of O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and –(CHR)$_L$-; L is an integer selected from the group consisting of 1, 2, 3, 4, 5 and 6; Y is -(CHR)$_n$-, where n is an integer in the range from 0 to 12 where R is selected from the group consisting of –H, -CH$_3$ and -C$_2$H$_5$; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of -H, -CH$_3$, and -C$_2$H$_5$; and where m is -(CH$_2$)$_n$- and where n is an integer in the range of from 0 to 4; and wherein when r is –H, at least one of q_1, q_2, q_3 and q_4 is -H.

182. The process of claim 168, wherein the cyclic olefinic pendent groups are selected from the group consisting of cyclohexene-4-methylene radical, 1-methyl cyclohexene-4-methylene radical, 2-methyl cyclohexene-4-methylene radical, 5-methyl cyclohexene-4-methylene radical, 1,2-dimethyl cyclohexene-4-methylene radical, 1,5-dimethyl cyclohexene-4-methylene radical, 2,5-dimethyl cyclohexene-4-methylene radical, 1,2,5-trimethyl cyclohexene-4-methylene radical,

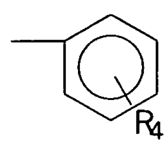
cyclohexene-4-ethylene radical, 1-methyl cyclohexene-4-ethylene radical, 2-methyl cyclohexene-4-ethylene radical, 5-methyl cyclohexene-4-ethylene radical, 1,2-dimethyl cyclohexene-4-ethylene radical, 1,5-dimethyl cyclohexene-4-ethylene radical, 2,5-dimethyl cyclohexene-4-ethylene radical, 1,2,5-trimethyl cyclohexene-4-ethylene radical, cyclohexene-4-propylene radical, 1-methyl cyclohexene-4-propylene radical, 2-methyl cyclohexene-4-propylene radical, 5-methyl cyclohexene-4-propylene radical, 1,2-dimethyl cyclohexene-4-propylene radical, 1,5-dimethyl cyclohexene-4-propylene radical, 2,5-dimethyl cyclohexene-4-propylene radical, 1,2,5-trimethyl cyclohexene-4-propylene radical, cyclopentene-4-methylene radical, 1-methyl cyclopentene-4-methylene radical, 3-methyl cyclopentene-4-methylene radical, 1,2-dimethyl cyclopentene-4-methylene radical, 3,5-dimethyl cyclopentene-4-methylene radical, 1,3-dimethyl cyclopentene-4-methylene radical, 2,3-dimethyl cyclopentene-4-methylene radical, 1,2,3-trimethyl cyclopentene-4-methylene radical, 1,2,3,5-tetramethyl cyclopentene-4-methylene radical, cyclopentene-4-ethylene radical, 1-methyl cyclopentene-4-ethylene radical, 3-methyl cyclopentene-4-ethylene radical, 1,2-dimethyl cyclopentene-4-ethylene radical, 3,5-dimethyl cyclopentene-4-ethylene radical, 1,3-dimethyl cyclopentene-4-ethylene radical, 2,3-dimethyl cyclopentene-4-ethylene radical, 1,2,3-trimethyl cyclopentene-4-ethylene radical, 1,2,3,5-tetramethyl cyclopentene-4-ethylene radical, cyclopentene-4-propylene radical, 1-methyl cyclopentene-4-propylene radical, 3-methyl cyclopentene-4-propylene radical, 1,2-dimethyl cyclopentene-4-propylene radical, 3,5-dimethyl cyclopentene-4-propylene radical, 1,3-dimethyl cyclopentene-4-propylene radical, 2,3-dimethyl cyclopentene-4-propylene radical, 1,2,3-trimethyl cyclopentene-4-propylene radical, and 1,2,3,5-tetramethyl cyclopentene-4-propylene radical.

183. The process of claim 78, wherein the polymer is a ethylene/methyl acrylate/cyclohexenyl methyl acrylate terpolymer.

184. A polymer comprising the formula:



wherein P+T+ Q is 100 mol % of the total composition; P, T, and Q are each greater than 0 mol % of the total composition; Z is selected from the group consisting of an aryl group; $-(C{=}O)OR_1$; $-O(C{=}O)R_1$; and an alkyl aryl group:



where R_4 is selected from the group consisting of $-CH_3$, ethyl, and hydrogen; R_1 is selected from the group consisting of hydrogen, methyl, ethyl, $-C_3H_7$ and $-C_4H_9$; R_2 and R_3 are selected from the group consisting of hydrogen and methyl; X is selected from the group consisting of -O-, -NH-, -(C=O)O-, -(C=O)NH-, -(C=O)S-, -O(C=O)- and $-(CHR)_L-$; L is an integer in the range from 1 to 6; Y is $-(CHR)_n-$, where n is an integer in the range from 0 to 12, R being selected from the group consisting of hydrogen, methyl and ethyl; where q_1, q_2, q_3, q_4, and r are selected from the group consisting of hydrogen, methyl, and ethyl; and where m is $-(CH_2)_n-$ and where n is an integer in the range from 0 to 4; and wherein when r is hydrogen, at least one of q_1, q_2, q_3 and q_4 is hydrogen.

185. Poly(ethylene/methyl acrylate/cyclohexene-methylacrylate).

186. A process for making a terpolymer, comprising transesterification of ethylene methyl acrylate copolymer with an alcohol comprising a cyclohexene moiety.

187. The process of claim 186, wherein the alcohol is 3-cyclohexene-1-methanol.

188. The process of claim 186, wherein the transesterification occurs in a reactive extrusion process.

189. A terpolymer prepared by transesterification of ethylene methyl acrylate copolymer with an alcohol comprising a cyclohexene moiety.

190. The terpolymer of claim 189, wherein the alcohol is 3-cyclohexene-1-methanol.

191. A composition comprising poly(ethylene/methyl acrylate/cyclohexene-methylacrylate) and an amount of a transition metal catalyst effective to catalyze oxygen scavenging.

192. An oxygen scavenging layer comprising poly(ethylene/methylacrylate/ cyclohexene-methylacrylate) and an amount of a transition metal catalyst effective to catalyze oxygen scavenging.

193. A film comprising poly(ethylene/methyl acrylate/cyclohexene-methylacrylate) and an amount of a transition metal catalyst effective to catalyze oxygen scavenging.

194. A packaging article comprising poly(ethylene/methyl acrylate/cyclohexene-methylacrylate) and an amount of a transition metal catalyst effective to catalyze oxygen scavenging.